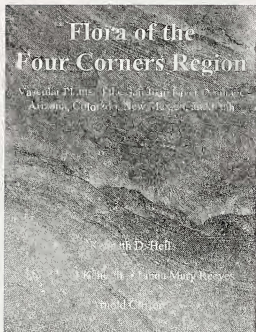


## REVIEW



*Flora of the Four Corners Region. Vascular Plants of the San Juan River Drainage: Arizona, Colorado, New Mexico, and Utah.* By KENNETH D. HEIL, STEVE L. O'KANE, JR., LINDA MARY REEVES, AND ARNOLD CLIFFORD. 2013. Monographs in systematic botany from the Missouri Botanical Garden, Vol. 124, Missouri

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The Four Corners Region is the relatively little-known area of the southwestern United States where four states meet at a common point. Characterized by stark topographic features and scenic vistas, this portion of the Colorado Plateau is drained by the San Juan River, a major tributary of the Colorado River. Elevations range from 1130 m at the mouth of the San Juan River to 4292 m at the summit of Mt. Eolus in the San Juan Mountains of Colorado.

The Four Corners Region is separated by considerable distances from major botanical centers and is divided among four states whose published floras were produced by botanists working at different institutions at different times. There has long been a need for a unified modern flora of the region that spans the state boundaries. And this book fills that void. *Flora of the Four Corners Region* is a multi-authored work that treats 120 families, 697 genera, 2117 species, and 186 (additional) infraspecific taxa. Forty-one of the terminal taxa are endemic or nearly so. Much care went into the development and production of this flora, and the authors and editors are to be congratulated for their efforts and the outstanding product that has resulted.

Multiple features make this a very attractive volume. A double-page map of the Four Corners area inside the front covers presents topography, state and county boundaries, and major localities. A second map inside the back covers presents the San Juan River and its tributaries. Several beautiful botanical watercolors grace the introductory pages. Introductory material includes brief sections on the scope and history of the project that produced the flora, discussions of the conventions used in the book, a family-by-family summary of the taxonomic representation of the flora, and overviews of the regional geology and climate.

Expanded descriptions of plant communities and vegetation are followed by discussions of plant migration routes and non-native plants. Four watercolor plates illustrating fifteen vegetation associations complete the introduction.

The taxonomic section of the book begins with a dichotomous key to families derived from the family key in *Colorado Flora: Western Slope* (Weber and Wittmann 2001). Taxonomic treatments are grouped as Ferns and Fern Allies (paraphyletic, including both lycophyte and fern families), Gymnosperms, and Angiosperms. Within these major groups, taxa are arranged alphabetically from family down. The full alphabetic merger of angiosperm families may be a bit jarring for those expecting the traditional separation of dicots and monocots or the more recent separation of angiosperms into monophyletic lineages as in the second edition of *California's Jepson Manual* (Baldwin et al. 2012). Keys are bracket-formatted.

Each generic and lower level taxonomic treatment includes scientific name, derivation of the generic name or epithet, and one or more common names. Full descriptions are provided for each taxon, and use of typeface conventions makes the descriptions easy to follow; character headings such as leaves, flowers, fruits, etc. are bold-faced, all caps, and each is spelled out, with the exception of inflorescence, which for some reason, is abbreviated INFL. For each terminal taxon a brief statement of habitat is followed by the geographic distribution in the Four Corners region. Elevations are given both in meters and feet, and both flowering and fruiting times are indicated. A statement of extralimital distribution is often followed by anecdotal comments. Excellent line drawings appear here and there for some taxa, but are very unevenly scattered among families. Inclusion of synonyms from older floras and other literature is eclectic.

Taxonomic treatments are uneven in their adherence to the recent changes resulting from molecular phylogenetic studies, such as the Angiosperm Phylogeny Group III classification (APG III 2009). Some family treatments are in accord with the updated classifications. Adoxaceae, for instance, is accepted in its modern circumscription, including *Sambucus*. Araceae includes Lemnaceae. The traditional Scrophulariaceae is broken apart with most taxa dispersed to Orobanchaceae, Phrymaceae, and Plantaginaceae.

Treatments of a number of angiosperm families, however, follow traditional circumscriptions. *Acer* L. is retained in Aceraceae, which in APG III (2009) is merged into the Sapindaceae.

Liliaceae, as treated in the Four Corners flora, is a highly polyphyletic assemblage with members assignable in APG III (2009) to multiple families in two orders; alternate family assignments are briefly discussed and were added by the editors to the key to genera of Liliaceae (s.l.). Hydrophyllaceae and Boraginaceae are maintained as separate families with no mention that they are sometimes merged. Asclepiadaceae is kept separate from the otherwise paraphyletic Apocynaceae; a comment under Apocynaceae acknowledges that there is strong evidence for combining the two. This should have been an easy prepublication merger. Portulacaceae is retained in the traditional circumscription with acknowledgement that most genera probably should be treated as a separate family (Montiaceae). In a similar fashion traditional Primulaceae is retained though alternate family placements for some genera are acknowledged. *Celtis* L. is in its traditional spot in Ulmaceae rather than in Cannabaceae; *Sarcobatus* Nees is retained in Chenopodiaceae rather than in its own family; *Hypericum* L. is in Clusiaceae rather than Hypericaceae; *Peganum* L. remains in Zygophyllaceae instead of Nitrariaceae; *Proboscidea* Schmidel is placed in Pedaliaceae rather than Martyniaceae. A similar tension exists in some families between updated and traditional generic circumscriptions.

The taxonomic treatment is followed by 20 pages of color photos of plant species (six per page, arranged alphabetically by binomial), a taxonomically arranged list of the line drawings that are dispersed through the text along with credits to the artists who created them, a 32 page un-illustrated glossary, 24 pages of literature cited, one and one-half pages of general references, and an index to the accepted scientific names and common names. Synonyms are not indexed.

A few miscellaneous comments and quibbles. This is not a field manual for the backpack; it measures  $8.75 \times 11.25 \times 2.25$  inches and weighs 6.35 pounds. A full-page watercolor on p. xiv is

labeled as "*Centaurea maculosa* Lam.," but the name used in the taxonomic treatment is "*Centaurea stoebe* subsp. *micranthos*" (S.G. Gmel. ex Gugler) Hayek. Etymologies of epithets and generic names for the most part appear to be accurate. The derivation of the specific epithet for *Pinus contorta* Douglas ex Loudon is given as "twisted together, referring to the needles" (p. 90). However the common name given by John Loudon, the botanist who described *P. contorta*, is "the twisted-branched pine" (Loudon 1838, p. 2292), which is descriptive of the wind-pruned form of the tree found by David Douglas along the coast of Washington and Oregon. The glossary definitions of spine, thorn, and prickles are accurate, but application of these terms in taxonomic treatments sometimes is not; a bit more editorial oversight would have helped here. The "seed" in the drawing of *Coleogyne ramosissima* Torr. is actually the fruit. But the errors are few and pale before the remarkable achievement this volume represents.

—DAVID J. KEIL, Biological Sciences Department, California Polytechnic State University, San Luis Obispo, CA 93407. dkeil@calpoly.edu.

#### LITERATURE CITED

- ANGIOSPERM PHYLOGENY GROUP (APG III). 2009. An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG III. *Botanical Journal of the Linnean Society* 161:105–121.
- BALDWIN B. G., D. H. GOLDMAN, D. J. KEIL, R. PATTERSON, T. J. ROSATTI, AND D. H. WILKEN (eds.). 2012. *The Jepson manual: vascular plants of California*, 2nd ed. University of California Press, Berkeley, CA.
- LOUDON J. C. 1838. *Arboretum et fruticetum Britannicum*, Vol. 4: from Garryaceae, p. 2031 to the end. Longman, Orme, Brown, Green, and Longmans, London.
- WEBER W. A. AND R. C. WITTMANN. 2001. *Colorado Flora: Western Slope*, 3rd ed. University Press of Colorado, Boulder, CO.